<u>**Amendments to the Claims:**</u>

This listing of claims will replace all prior versions and listings of claims in the application:

<u>**Listing of Claims:**</u>

1- 45 (Canceled)

46. (Previously Presented) A method, embodied in a computer program, for automated extraction data from a molecular array having features arranged in a regular pattern, the method comprising:

receiving a number of images of the molecular array, each produced by scanning the molecular array to determine intensities of data signals emanating from discrete positions on a surface of the molecular array;

estimating initial positions of selected marker features within an image of the molecular array;

calculating refined positions of the selected marker features within the image of the molecular array;

using the refined positions of the selected marker features to compute an initial coordinate system for locating features of the molecular array in the number of images of the molecular array;

using the initial coordinate system to locate positions of strong features within one or more images of the molecular array;

refining the positions of strong features within the one or more images of the molecular array by analyzing data signal intensity values in regions of the one or more images of the

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molecular array that contain the strong features;

using the refined positions of strong features in the one or more images of the molecular array to calculate a refined coordinate system to locate positions of weak features within the number of images of the molecular array;

using the refined positions of strong features in the one or more images of the molecular array to calculate a refined coordinate system to locate positions of local background regions surrounding all strong and weak features within the number of images of the molecular array; and

extracting data from strong features, and their respective local background regions, within the number of images of the molecular array using the refined positions of strong features within the number of images of the molecular array and extracting data from weak features, and their respective local background regions, within the number of images of the molecular array using locations for the weak features calculated from the refined coordinate system.

47. (Previously Presented) The method of claim 46 wherein data signals emanating from discrete positions on the surface of the molecular array include:

fluorescent emission from fluorophores incorporated into molecules bound to features of the molecular array;

radiation emitted by radioisotopes incorporated into molecules bound to features of the molecular array; and

light emission from chemoluminescent moieties incorporated into molecules bound to features of the molecular array.

48. (Previously Presented) The method of claim 46 wherein each image of the number of images

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comprise an array of pixels, each pixel having a data signal intensity value.

49. (Previously Presented) The method of claim 48 wherein the features of the molecular array are arranged in a rectilinear grid, wherein corner features are selected as marker features, and wherein estimating initial positions of selected marker features within an image of the molecular array further includes:

calculating row and column vectors by considering the values of pixels in rows and columns of the image;

determining a first and last peak in the row and column vectors; and

using pixel coordinates of the first and last peaks in the row vector to determine horizontal coordinates of the corner features and using pixel coordinates of the first and last peaks in the column vector to determine vertical coordinates of the corner features.

50-58 (Canceled)

59. (Previously Presented) A system for automated extraction of data from a molecular array having features arranged in a regular pattern, the system comprising:

a scanning component that produces images of the molecular array representing intensities of data signals emitted from discrete positions on a surface of the molecular array;

a computer program that processes the images of the molecular array produced by the scanning component to index features in the images of the molecular array corresponding to molecules bound to features of the molecular array and that extracts data from the indexed features within images of the molecular array; and a computer for executing the computer program.

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60. (Currently Amended) A The system of claim 59 wherein data signal intensities emanating from discrete positions on the surface of the molecular array include:

radiation emitted by radioisotopes incorporated into molecules bound to features of the molecular array;

fluorescent emission from fluorophores incorporated into molecules bound to features of the molecular array; and

light emission from chemoluminescent moieties incorporated into molecules bound to features of the molecular array.

61. (Previously Presented) The system of claim 59 wherein the computer program processes the images of the molecular array and extracts data from indexed features within images of the molecular array by:

receiving a number of images of the molecular array produced by the scanning component;

estimating initial positions of selected marker features within an image of the molecular array;

calculating refined positions of the selected marker features within the image of the molecular array;

using the refined positions of the selected marker features to compute an initial coordinate system for locating features of the molecular array in the number of images of the molecular array;

using the initial coordinate system to locate positions of strong features within one or more images of the molecular array;

refining the positions of strong features within the one or more images of the molecular

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array by analyzing data signal intensity values in regions of the one or more images of the molecular array that contain the strong features;

using the refined positions of strong features in the one or more images of the molecular array to calculate a refined coordinate system to locate positions of weak features within the number of images of the molecular array;

using the refined positions of strong features in the one or more images of the molecular array to calculate a refined coordinate system to locate positions of local background regions surrounding all strong and weak features within the number of images of the molecular array; and

extracting data from strong features, and their respective local background regions, within the number of images of the molecular array using the refined positions of strong features within the number of images of the molecular array and extracting data from weak features, and their respective local background regions, within the number of images of the molecular array using locations for the weak features calculated from the refined coordinate system.

62-63 (Canceled)

64. (Previously Presented) A method for evaluating an orientation of a molecular array having features arranged in a pattern, the method comprising:

(a) receiving an image of the molecular array produced by scanning the molecular array to determine data signals emanating from discrete positions on a surface of the molecular array;

(b) calculating an actual result of a function on pixels of the image lying in a second pattern;

(c) comparing the result of step (b) with an expected result which would be obtained if the second pattern had a predetermined orientation on the array; and

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(d) when the results of the comparison in step (c) are outside a predetermined difference, then altering the orientation of the second pattern on the array and repeating steps (b) and (c), and repeating the foregoing as needed until the results of the comparison are within the predetermined difference.

65. (Previously Presented) The method of claim 64 wherein:

the features are arranged in a rectilinear grid and the pattern comprises a rectilinear grid of rows and columns; and

step (b) comprises calculating row and column vectors by summing pixels in the rows and columns.

66. (New) A method, embodied in a computer program, for automated extraction data from a molecular array having features arranged in a regular pattern, the method comprising:

receiving an image of the molecular array, produced by scanning the molecular array to determine intensities of data signals emanating from discrete positions on a surface of the molecular array;

estimating initial positions of selected marker features within the image of the molecular array;

calculating refined positions of the selected marker features within the image of the molecular array;

using the refined positions of the selected marker features to compute a grid for locating features of the molecular array in the image of the molecular array;

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using the initial grid system to locate positions of strong features within the image of the molecular array;

refining the positions of strong features within the image of the molecular array by analyzing data signal intensity values in regions of the image of the molecular array that contain the strong features;

using the refined positions of strong features in the image of the molecular array to calculate a refined system to locate positions of weak features within the image of the molecular array;

using the refined positions of strong features in the image of the molecular array to calculate a refined grid system to locate positions of local background regions surrounding all strong and weak features within the image of the molecular array; and

extracting data from strong features, and their respective local background regions, within the image of the molecular array using the refined positions of strong features within the image of the molecular array and extracting data from weak features, and their respective local background regions, within the image of the molecular array using locations for the weak features calculated from the refined grid system.

67.   (New) A system for automated extraction of data from a molecular array having features arranged in a regular pattern, the system comprising:

a scanning component that produces an image of the molecular array representing intensities of data signals emitted from discrete positions on a surface of the molecular array;

a computer program that processes the image of the molecular array produced by the scanning component to identify the location of features in the image of the molecular

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array corresponding to molecules bound to features of the molecular array and that extracts data from the located features within an image of the molecular array; and a computer for executing the computer program.

68.   (New) A method for evaluating an orientation of a molecular array having features arranged in a pattern, the method comprising:

(a) receiving an image of the molecular array produced by scanning the molecular array to determine data signals emanating from discrete positions on a surface of the molecular array;

(b) calculating an actual result of a function on pixels of the image lying in a pattern; and

(c) altering the orientation of the pattern on the array and repeating steps (a) and (b) as needed until the results of the comparison are within the predetermined difference.

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